REMARKS

In the office action dated December 4, 2002 and made final, claims 1-6 and 10-11 were rejected under 35 USC §103(a) as being unpatentable over Parkin U.S. Patent No. 5,966,012 in view of Lin U.S. Patent No. 5,949,623. This rejection was maintained in the advisory action dated February 11, 2003. The '103 rejection is respectfully traversed.

Claim 1 recites a magnetic tunnel junction comprising a data layer having a magnetization that can be oriented in first and second directions; a synthetic ferrimagnet reference layer; and an insulating tunnel barrier between the data layer and the reference layer. The reference layer is not pinned.

The documents made of record do not teach or suggest a magnetic tunnel junction having an unpinned reference layer. Parkin discloses reference layers that are pinned. See col. 6, lines 1+, where Parkin discloses a reference layer 118 having a magnetization that is fixed by an AF pinning layer 116, and a sensing layer 132 atop the reference layer 118. Columns 1-2 of Parkin do not teach or suggest an unpinned reference layer.

The advisory action suggests that the reference layer of Parkin's magnetic tunnel junction "can be" unpinned. However, this suggestion appears to come from the examiner, not Parkin.

The suggestion does not come from Lin either. Lin discloses anisotropic magnetoresistive (AMR) and giant magnetoresistive (GMR) sensors. Both a GMR device and an AMR device include a sense layer and reference layer separated by a spacer layer made of an electrically conductive material such as copper.

Although primarily disclosing reference layers with pinned magnetizations, Lin does mention at col. 1, lines 36-38 that the reference layer of an AMR device may generate a transverse bias field by activation from the current supplied to the sensor.

However, this one passage does not suggest that the reference layer of a magnetic tunnel junction can be unpinned. An AMR device has a different structure than a magnetic tunnel junction (e.g., an electrically conductive spacer layer versus an insulating tunnel barrier) and its resistance is measured differently (in-plane resistance versus through-plane resistance).

In the advisory action the examiner appears to argue that Parkin and Lin are analogous and, therefore, can be combined. Yet as MPEP 2143.01 points out, just because references can be combined, doesn't mean that there is a reason, motivation or incentive for combining them.

In the advisory action, the examiner argues that the motivation for modifying Parkin's magnetic tunnel junction is "sensing the resistance of the sense layer." He is mistaken. The resistance of the sense layer of a magnetic tunnel junction is not measured; the resistance across the insulating tunnel barrier (the through-plane resistance) is measured.

Moreover, if the modification proposed by the examiner is made, the resulting magnetic tunnel junction would be rendered unusable for its intended purpose, since ***neither Parkin nor Lin teach or suggest how to determine the magnetization orientation (whether parallel or anti-parallel) of magnetic tunnel junction having an unpinned reference layer.*** That is, neither Parkin or Lin teach or suggest how to determine the data value stored in a magnetic tunnel junction if the magnetization vector of the reference layer is not fixed.

MPEP 2143.01 states that the proposed modification cannot render the prior art unsatisfactory for its intended purpose. "If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)." Thus the cited documents offer no suggestion or motivation for modifying Parkin's magnetic tunnel junction in the manner proposed by the examiner.

The application, on the other hand, teaches how to read a data value stored in a magnetic tunnel junction having an unpinned reference layer.

Because the cited documents do not teach or suggest a magnetic tunnel junction having an unpinned reference layer, the '103 rejection of claim 1 should be withdrawn. Accordingly, claim 1 and its dependent claims 2-6, 9 and 12 should be allowed (claims 10-11 are cancelled).

Claims 18 and 20-22 are rejected under 35 USC §103(a) as being unpatentable over the combination of Parkin, Lin, Monsma and Gallagher. Claim 18 has been amended to recite magnetic tunnel junctions, and claims 19-21 have been amended to depend properly from claim 18. Claim 22 has been cancelled. Claims 18-21 should be allowed for the reasons above, since Gallagher and Monsma also disclose magnetic tunnel junctions having pinned reference layers.

In the office action dated December 12, 2002, claims 7-8 are rejected under 35 USC §103(a) as being unpatentable over Parkin U.S. Patent No. 5,966,012 in view of Dahlberg et al. U.S. Patent No. 6,166,539. The advisory action maintains the rejection. This rejection is respectfully traversed.

Claim 7 recites a magnetic memory device including a data layer, and a synthetic ferrimagnet reference layer, the data and reference layers having different coercivities. Claim 7 further recites a first conductor on the reference layer; an electrical insulator on the first conductor; and a second conductor on the insulator. The second conductor may be used to set the magnetization orientation of the reference layer during read operations.

The office action dated December 12, 2002 states that Parkin shows first and second layers of conductors 102 and 112. According to col. 5, lines 66+ of Parkin, a seed layer 112 is formed on an electric conductor 102. The seed layer 112 is used to establish a crystal orientation for the overlying pinning layer 116. The passage does not teach or suggest a layer between the seed layer 112 and the conductor 102, and Figure 4a of Parkin does not show any layer between layers 102 and 112.

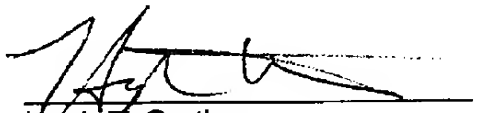
Moreover, there is no reason, incentive, or motivation to place an insulator between the layers 102 and 112 of Parkin's device. Parkin discloses a TMR device. During a read operation, through-plane resistance of the TMR device is measured, that is, resistance is measured between conductor 102 and a top electrical lead 104. Placing an insulator between layers 102 and 112 would prevent the through-plane resistance from being measured. Thus the magnetic tunnel junction would be rendered unusable for its intended purpose.

Dahlberg et al. do not disclose a TMR device. They do not offer a reason, motivation or incentive for placing an insulator between the layers 102 and 112 of Parkin's TMR device. Therefore, claim 7 and its dependent claim 8 should be allowed over Parkin and Dahlberg et al.

Claim 23 is added to the application. An added claims fee has not been incurred since the total number of claims is less than twenty.

The Examiner is respectfully requested to withdraw the rejections and issue a notice of allowability. If any issues remain, the Examiner is invited to contact the undersigned.

Respectfully submitted,



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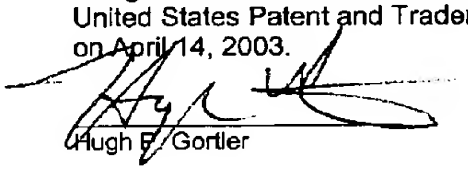

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